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Management of zoonosis on-farm.

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Introduction.
There are around 1500 infectious diseases known in man, of which around 60 % are "multi-host" infections, almost 900 pathogenic species (Taylor et al., 2001). Many of these are rare in some parts of the world, more abundant in others, and a disease emerges roughly every 8 months, and of these, around 75 % appear to be multi-host. Zika-virus is a recent example, as is Middle East Respiratory Syndrome – Coronavirus (MERS-CoV). More common and well–known examples are *Salmonella* species, *Campylobacter* species, *Escherichia coli* types, many other bacterial agents, and several viral, fungal and parasitic diseases. They pose risks on the one hand to people working with animals, and on the other hand to people consuming products derived from these animals. While it is not always possible to fully prevent or control transmission of these diseases from animals to people, it is important to be aware of their presence and to understand where there is a role for the veterinary practitioner and for the owners of the animals alike.

In this paper some aspects of zoonotic diseases will be discussed, with emphasis on how management of these diseases fits in with disease management at national and even supra-national levels, and where the individual veterinary practitioner and their clients fit in.

Zoonotic diseases in farm animals.
There are many zoonotic infections that might be present on farms and not all of them are all that well controllable. Many of the species that are relevant as zoonotic agents do not cause any problems in animals and will therefore in many cases not come to the attention of both the farmer and the veterinary surgeon. The most well-known groups of zoonotic micro-organisms are *Salmonella*, *Campylobacter*, and *Escherichia coli*. Other important ones are *Yersinia enterocolitica*, *Clostridium difficile*, *Leptospira* and *Listeria monocytogenes* (although the last one is a soil contaminant and therefore in a strict sense not a zoonosis). *Listeria* does cause problems in animals as well, ranging from meningitis or abortion to sepsis. Though in prevalence of lesser importance than *E. coli*, *Campylobacter* and *Salmonella*, the clinical symptoms in people are often very serious and the mortality is relatively high.

Campylobacter is probably the most frequent cause of food borne infections in people, usually causing gastro-intestinal symptoms in people, and in some cases serious complications such as Guillain-Barré syndrome, a progressive paralysis. Most often poultry meat is implicated as the source of the infection, but other livestock species (as well as companion animals) can be carriers (Humphrey et al., 2007). Some strains of *Campylobacter* can cause disease in animals as well. It proves to be extremely difficult to keep flocks of poultry free of this organism. The most important measures to take to prevent infection of people are therefore associated with kitchen hygiene: making sure that raw and cooked products are not mixed, and that separate cutlery is used for (raw) vegetable foodstuffs and raw (poultry) meat. And, most importantly, making sure that the meat is properly cooked. Generally, infections are present on the outside of meats, and proper preparation will generally kill the organisms. When using mincemeat, the organisms will be present throughout the product and minced products (such as hamburgers) should therefore always be thoroughly cooked. On farm and during processing in abattoirs, maintaining high levels of hygiene do contribute to risk reduction.

Of the approximately 2500 different *Salmonella* subtypes known, several are pathogenic for people, several are pathogenic for people as well as animals, and several are pathogenic for animals. *Salmonella Dublin* for example causes serious health problems with mortality in cattle, while *Salmonella typhimurium* can be a pathogen both for animals and for people. *Salmonella enteritidis* is a type mostly found in poultry, not causing any problems, while it is a serious pathogen for people. *Salmonella pullorum* causes serious losses in (young) poultry. Most types are situated in the gut of animals and therefore generally the faeces are a source of infection. Quite a lot of attention has gone into *S. enteritidis* over many years. This particular type will infect the ovaries of laying hens, as a result of which the bacterium can be present inside eggs. For this particular type, a vaccination programme is now used in the laying industry which has shown to be highly successful in controlling foodborne Salmonellosis because of it. No such vaccination programmes are currently carried out for any other *Salmonella* types. It is well-known, that up to 25 % of slaughter pigs are carriers of the organisms and that they can start displaying Salmonellas in their gut very quickly during transport to the abattoir (Berends et al., 1996).

On-farm prevention consists of maintaining high levels of hygiene and "normal" biosecurity measures to prevent infectious agents to be transferred from one animal group to the other. In intensive livestock systems it is imperative to maintain all-in-all-out management and meticulous cleaning and disinfection between rounds. In cattle and sheep systems however, hygiene is equally important.

Many types of *Escherichia coli* are known. The vast majority of these are normal commensal bacteria in the gut of animals as well as people. As with Salmonella, there are several types that are specifically pathogenic for a variety of animal species while not causing any problems in others. *E. coli* O157:H7 is a type that has been studied extensively over the last years. It lives as a commensal in the gut of cattle and it can cause serious gastro-intestinal problems in people, with some, particularly small children, developing haemorrhagic uremic syndrome, which can be a deadly disease. In England and Wales, 4.7 % of the cattle population was found to excrete this *E. coli* type (Synge and Paiba, 2000). It could be isolated from 34.5 % of dairy herds and 53.3 % of fattening herds. At the moment there are no specific measures that can be taken to remove the agent from animals. There seems to be an association with feeding diets with high levels of compound feed and shedding of the bacteria, whereby animals fed high compound feed diets shed the bacteria more and more often. Another phenomenon that is mentioned in particular in relation to this pathogen, is supershedding: some animals seem to excrete the bacteria in very high numbers (Chase-Topping et al., 2007). On farm hygiene is extremely important to reduce spread of this agent between animals on a farm. Man is the most important factor. Keeping the environment clean contributes to reduction of spread. In water troughs for example, the bacterium can stay alive for months if they are not cleaned regularly. Also in stagnant puddles the bacterium can survive for many weeks.

On-farm hygiene is, in any case, centrally important in preventing zoonotic micro-organisms from ending up in the product, be it meat, milk or eggs. Micro-organisms live in the intestines, and are excreted with the faeces, and subsequently may end up on the skin. Generally the gut and the skin are considered the most likely source for contamination of the product. The dirtier the skin, the more difficult it is for the processors in an abattoir to prevent contamination. There is a very clear association with the cleanliness of the hide or fleece and the contamination of carcasses with faecal material. That is the reason that abattoirs generally have clean livestock policies, meaning that animals are required to be brought to the abattoir clean enough to be slaughtered. If animals are too dirty to be slaughtered, the abattoir management will have the option to refuse them access, and ultimately the Official Veterinarian has the authority to reject animals and refuse them access to the slaughter process. As animals will at that point have been offloaded at the abattoir, this will mean they are going to be killed and destroyed, as it is not allowed to remove animals from abattoir premises once they have been offloaded.

Clean animals come from a clean environment and keeping a good standard of hygiene on farm is essential, not only to fulfil the requirements of the clean livestock policy one might encounter in the abattoir, but also to prevent spread of infections across the farm. This means that areas are regularly cleaned and mucked out, if litter is being used this is replaced at proper intervals or topped up regularly, and the surroundings of the farm are kept tidy. Where appropriate, farmers might adopt use of protective clothing and foot dips, which is already quite commonplace in the pig and poultry industry. As vermin can spread disease as well, good vermin control coupled with the tidy workplace is also helpful.

Conclusions.

Control and management of zoonotic infections on farm is not always easy. Though not impossible (farms selling raw milk and raw milk products directly to consumers have to test regularly and will have to take measures to make sure the products are safe), it is often quite an effort. That does however not mean that nothing can be done. A good level of hygiene on-farm does help in preventing contamination through soiling of hides or fleeces with faeces, which is a major element in keeping livestock clean, and an essential element in keeping contamination within acceptable boundaries.

References.

1. Berends, B.R., H.A.P. Urlings, J.M.A. Snijders, F. Van Knapen, 1996. Identification of risk factors in animal management and transport regarding *Salmonella* spp. in pigs. Int. J. Food Microbiology 1996; 30:37-53

2. Chase-Topping, M. E., I.J. McKendrick, M.C. Pearce, P. MacDonald, L. Matthews, J. Halliday, L. Allison, D. Fenlon, J.C. Low, G. Gunn and M.E.J. Woolhouse, 2007. Risk factors for the presence of high-level shedders of Escherichia coli O157 on Scottish farms. J. Clin. Microbiol. 45, 1594–1603.

3. Humphrey, T, S. O'Brien, M. Madsen, 2007. *Campylobacters* as zoonotic pathogens: A food production perspective. International Journal of Food Microbiology, 117, 3, Pages 237–257

4. Synge, B., and G. Paiba, 2000. Verocytotoxin producing E. coli O157. Vet. Rec. 147, 27

5. Taylor, L.H., S.M. Latham and M.E.J. Woolhouse, 2001. Risk factors for human disease emergence. Phil. Trans. R. Soc. Lond. B 356, 983-989